PROCEEDINGS OF

THE ROYAL SOCIETY.

SECTION B.—BIOLOGICAL SCIENCES.

Trypanosome Diseases of Domestic Animals in Nyasaland.
III.—Trypanosoma pecorum.

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INTRODUCTION.

This trypanosome has been found in the neighbourhood of the camp at Kasu, in cattle, wild game and wild tsetse flies. In a herd of cattle belonging to the Mvera Mission, which lies about two miles to the east, 32 per cent. were found to be infected by this disease. The mission station is built near the edge of the "fly-country," and there is little doubt that the cattle were at times exposed to the bite of the "fly." After the disease had been discovered to be present in the herd the animals were prevented from grazing in the direction of the danger, and since then no new cases have occurred. It is also the species of trypanosome most commonly found in the blood of the wild game in this district, and consequently the tsetse fly is found infected with it more frequently than with any other. It is one of the most important trypanosome diseases of domestic animals in Central Africa, as it affects them all—horses, cattle, goats, sheep, pigs, and dogs.

MORPHOLOGY OF TRYPANOSOMA PECORUM.

The description already given* of this species of trypanosome as regards its movements and appearance when alive, its shape, contents of cell, etc., when stained, are applicable to the species as it occurs in Nyasaland and need not be repeated.

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* 'Roy. Soc. Proc.,' 1910, B, vol. 82, p. 468.

I. *The Mvera Cattle Strain.*

Length.—The following table gives the length of this trypanosome as found in the donkey, ox, goat, dog, and rat—500 trypanosomes in all:—

Table I.—Measurements of the Length of the Trypanosome of the Mvera Cattle Strain.

Date.	No. of expt.	Animal.	Method of fixing.	Method of staining.	In microns.		
					Average length.	Maximum length.	Minimum length.
1912.							
Jan. 25 ...	70	Donkey	Osmic acid	Giemsa	14·1	16·0	11·0
March 15 ...	291	"	"	"	12·9	16·0	11·0
April 16 ...	445	"	"	"	14·0	16·0	12·0
" 18 ...	291	"	"	"	13·0	15·0	12·0
Jan. 17 ...	102	Ox	"	"	14·8	17·0	13·0
" 17 ...	103	"	"	"	13·9	16·0	12·0
Feb. 9 ...	100	"	"	"	13·0	15·0	11·0
" 9 ...	103	"	"	"	14·6	17·0	11·0
" 9 ...	103	"	"	"	14·5	17·0	12·0
" 20 ...	104	"	"	"	14·0	16·0	12·0
" 26 ...	100	"	"	"	14·4	16·0	11·0
March 1 ...	227	"	"	"	14·0	16·0	12·0
" 1 ...	228	"	"	"	14·5	18·0	11·0
Feb. 26 ...	208	Goat	"	"	13·2	15·0	9·0
" 29 ...	178	"	"	"	13·2	15·0	10·0
March 11 ...	206	"	"	"	14·6	17·0	11·0
" 11 ...	208	"	"	"	14·6	16·0	12·0
May 20 ...	199	"	"	"	13·3	15·0	12·0
Feb. 15 ...	16	Dog	"	"	13·8	16·0	11·0
" 26 ...	212	"	"	"	14·4	16·0	13·0
" 26 ...	214	"	"	"	13·3	16·0	11·0
" 26 ...	217	"	"	"	13·5	15·0	12·0
March 4 ...	218	"	"	"	13·8	16·0	12·0
" 14 ...	223	Rat	"	"	14·8	16·0	13·0
" 18 ...	223	"	"	"	14·7	16·0	13·0
					14·0	18·0	9·0

The average length of the trypanosome of the Mvera Cattle strain, in different species of animals, is as follows (Table II):—

Rats were, as a rule, immune to this strain, but on one occasion, in a case of mixed infection, it was found along with *T. brucei*. It was thought that the presence of *T. brucei* may have broken down the rat's immunity to *T. pecorum*.

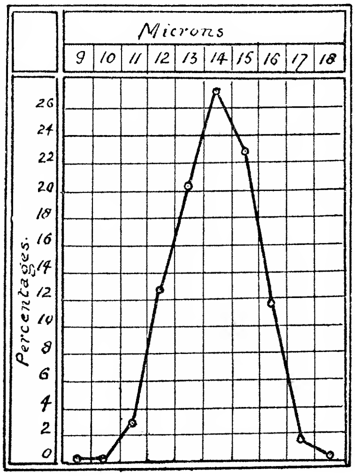
Table II.

Species of animal.	Number of trypanosomes measured.	In microns.		
		Average length.	Maximum length.	Minimum length.
Donkey	80	13·5	16·0	11·0
Ox	180	14·2	17·0	11·0
Goat.................	100	13·8	17·0	9·0
Dog	100	13·8	16·0	11·0
Rat	40	14·8	16·0	13·0

Table III.—Distribution in respect to Length of 500 Individuals of the Mvera Cattle Strain.

Animal.	In microns.											Average length.
	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	
Donkey	—	—	1	2	5	2	6	4	—	—	—	14·1
,, ...	—	—	1	8	5	4	1	1	—	—	—	12·9
,, ...	—	—	—	2	4	8	4	2	—	—	—	14·0
,, ...	—	—	—	9	3	6	2	—	—	—	—	13·0
Ox	—	—	—	—	6	4	7	2	1	—	—	14·8
,, ...	—	—	—	4	5	3	4	4	—	—	—	13·9
,, ...	—	—	3	4	6	3	4	—	—	—	—	13·0
,, ...	—	—	2	1	1	6	5	2	3	—	—	14·6
,, ...	—	—	—	1	2	8	5	3	1	—	—	14·5
,, ...	—	—	—	2	5	5	7	1	—	—	—	14·0
,, ...	—	—	1	2	1	5	5	6	—	—	—	14·4
,, ...	—	—	—	3	4	5	6	2	—	—	—	14·0
,, ...	—	—	1	1	3	5	6	1	2	1	—	14·5
Goat	1	—	—	4	5	7	3	—	—	—	—	13·2
,, ...	—	1	2	1	8	4	4	—	—	—	—	13·2
,, ...	—	—	—	1	4	4	4	7	—	—	—	14·6
,, ...	—	—	1	2	1	4	5	6	1	—	—	14·6
,, ...	—	—	—	6	4	7	3	—	—	—	—	13·3
Dog	—	—	1	4	2	6	5	2	—	—	—	13·8
,, ...	—	—	—	—	4	6	7	3	—	—	—	14·4
,, ...	—	—	2	3	5	7	2	1	—	—	—	13·3
,, ...	—	—	—	2	9	6	3	—	—	—	—	13·5
,, ...	—	—	—	2	7	5	4	2	—	—	—	13·8
Rat	—	—	—	—	1	7	7	5	—	—	—	14·8
,, ...	—	—	—	—	1	·9	5	5	—	—	—	14·7
Totals	1	1	15	64	101	136	114	59	8	1	—	
Percentages	0·2	0·2	3·0	12·8	20·2	27·2	22·8	11·8	1·6	0·2	—	

CHART 1.—Curve representing the Distribution, by Percentages, in respect to Length, of 500 Individuals of *Trypanosoma pecorum*—The Mvera Cattle Strain.



This curve is made up of measurements from 80 specimens of trypanosomes taken from the donkey, 180 from the ox, 100 from the goat, 100 from the dog, and 40 from the rat.

Breadth.—Measured across the broadest part of the body, but not including the undulating membrane, the Mvera Cattle strain of *T. pecorum* averages 1·97 microns (maximum 3, minimum 1·25).

II. *The Wild-game Strain.*

The citrated blood of the wild game was brought up from the "fly-country" by a motor-cyclist, and at once injected into a goat, monkey and dog. A description of the kind of wild game found in this locality and the trypanosomes they are infected with was given in a previous paper.*

Length.—The following table gives the length of this trypanosome as found in the goat, monkey, dog, and rat, 500 trypanosomes in all:—

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* 'Roy. Soc. Proc.,' 1913, B, vol. 86, p. 269.

Table IV.—Measurements of the Length of *Trypanosoma pecorum*—The Wild-game Strain.

Date.	No. of expt.	Animal.	Method of fixing.	Method of staining.	In microns.		
					Average length.	Maximum length.	Minimum length.
1912.							
Feb. 1...	45	Goat	Osmic acid	Giemsa	15·7	17·0	13·0
Aug. 26...	898	"	"	"	14·6	17·0	12·0
Sept. 2...	1031	"	"	"	14·1	16·0	12·0
" 9...	1037	"	"	"	13·9	16·0	12·0
" 9...	1039	"	"	"	15·0	18·0	12·0
" 9...	1121	"	"	"	14·5	16·0	13·0
" 12...	1039	"	"	"	14·3	16·0	12·0
" 23...	1383	"	"	"	13·3	15·0	11·0
Oct. 7...	1307	"	"	"	13·7	16·0	12·0
" 7...	1383	"	"	"	13·4	16·0	12·0
April 22...	403	Monkey	"	"	14·1	17·0	12·0
Sept. 9...	1085	"	"	"	14·6	17·0	11·0
April 8...	355	Dog	"	"	14·2	17·0	12·0
" 11...	356	"	"	"	14·3	17·0	12·0
Aug. 19...	1015	"	"	"	14·8	17·0	13·0
Sept. 2...	1086	"	"	"	14·3	16·0	12·0
" 9...	1086	"	"	"	14·9	17·0	13·0
" 12...	1015	"	"	"	14·0	16·0	12·0
" 12...	1086	"	"	"	14·1	16·0	13·0
Nov. 7...	1510	"	"	"	14·0	16·0	12·0
" 18...	1510	"	"	"	14·2	16·0	12·0
May 16...	511	Rat	"	"	14·3	18·0	12·0
Nov. 26...	1518	"	"	"	14·1	16·0	12·0
Dec. 26...	1608	"	"	"	15·0	18·0	13·0
" 26...	1608	"	"	"	14·6	17·0	13·0
					14·3	18·0	11·0

The average length of the trypanosome of the Wild-game strain, in different species of animals, is as follows:—

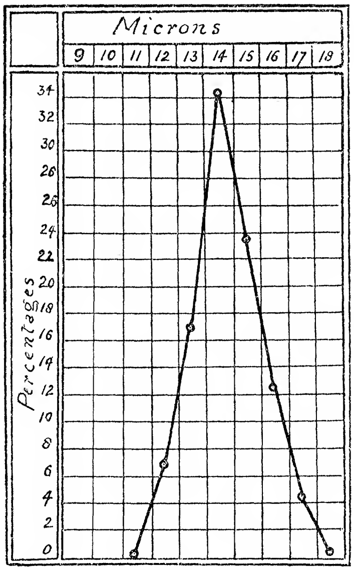
Table V.

Species of animal.	Number of trypanosomes measured.	In microns.		
		Average length.	Maximum length.	Minimum length.
Goat	200	14·2	18·0	11·0
Monkey	40	14·3	17·0	11·0
Dog	180	14·3	17·0	12·0
Rat	80	14·5	18·0	12·0

Table VI.—Distribution in respect to Length of 500 Individuals of the Wild-game Strain.

Animal.	In microns.								Average length.
	11.	12.	13.	14.	15.	16.	17.	18.	
Goat	—	—	1	4	6	5	4	—	15 ·7
,,	—	1	2	7	6	2	2	—	14 ·6
,,	—	1	3	11	3	2	—	—	14 ·1
,,	—	1	8	5	3	3	—	—	13 ·9
,,	—	1	2	3	7	4	2	1	15 ·0
,,	—	—	4	7	4	5	—	—	14 ·5
,,	—	2	—	10	5	3	—	—	14 ·3
,,	1	4	4	10	1	—	—	—	13 ·3
,,	—	1	8	8	2	1	—	—	13 ·7
,,	—	5	5	8	1	1	—	—	13 ·4
Monkey	—	3	3	7	4	1	2	—	14 ·1
,,	1	—	3	7	3	3	3	—	14 ·6
Dog	—	3	2	5	8	1	1	—	14 ·2
,,	—	2	6	4	2	4	2	—	14 ·3
,,	—	—	4	4	5	5	2	—	14 ·8
,,	—	1	1	11	5	2	—	—	14 ·3
,,	—	—	1	6	8	4	1	—	14 ·9
,,	—	3	3	5	8	1	—	—	14 ·0
,,	—	—	5	9	4	2	—	—	14 ·1
,,	—	2	5	5	7	1	—	—	14 ·0
,,	—	1	4	8	3	4	—	—	14 ·2
Rat	—	1	2	9	7	—	—	1	14 ·3
,,	—	2	3	8	5	2	—	—	14 ·1
,,	—	—	2	6	5	5	1	1	15 ·0
,,	—	—	4	5	7	2	2	—	14 ·6
Total	2	34	85	172	119	63	22	3	
Percentages	0 ·4	6 ·8	17 ·0	34 ·4	23 ·8	12 ·6	4 ·4	0 ·6	

Chart 2.—Curve representing the Distribution, by Percentages, in respect to Length, of 500 Individuals of *T. pecorum,* Wild-game Strain, taken at random from various animals.



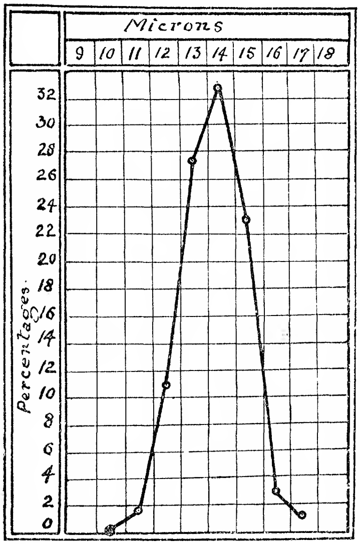
This curve is made up of measurements from 200 specimens of trypanosomes taken from the goat, 40 from the monkey, 180 from the dog, and 80 from the rat.

The following table gives the distribution in respect to length of *T. pecorum,* Wild-game strain, taken from a single rat on consecutive days, as was done in the description of the morphology of *T. brucei* vel *rhodesiense.* In this case the rat is not a suitable animal, since many strains of *T. pecorum* have no effect on it:—

Table VII.—Distribution in respect to Length of 500 Individuals of the Wild-game Strain, taken on nine consecutive days from Rat 510.

Animal.	In microns.								Average length.
	10.	11.	12.	13.	14.	15.	16.	17.	
Rat	—	—	2	2	7	6	2	1	14·3
,,	—	—	4	4	11	1	—	—	13·4
,,	—	1	1	8	8	2	—	—	13·4
,,	—	—	3	10	3	4	—	—	13·4
,,	—	1	1	9	6	3	—	—	13·4
,,	—	—	6	3	8	3	—	—	13·4
,,	—	—	1	8	6	4	1	—	13·8
,,	—	—	1	5	6	7	1	—	14·1
,,	—	—	2	7	4	7	—	—	13·8
,,	—	—	—	3	5	11	—	1	14·5
,,	—	2	1	4	9	4	—	–	13·6
,,	—	—	7	7	5	1	—	—	13·0
,,	—	—	5	4	9	1	1	—	13·4
,,	—	1	1	8	7	3	—	—	13·5
,,	1	—	3	8	3	5	—	—	13·3
,,	—	1	—	2	5	5	5	2	14·8
,,	—	—	—	10	5	5	—	—	13·7
,,	—	1	2	4	8	5	—	—	13·7
,,	—	—	1	3	8	7	—	1	14·2
,,	—	—	1	6	9	4	—	—	13·8
,,	—	—	—	2	7	8	3	—	14·6
,,	—	2	1	5	4	8	—	—	13·7
,,	—	—	5	4	9	2	—	—	13·4
,,	—	—	3	6	5	6	—	—	13·7
,,	—	—	2	5	6	5	1	1	14·0
Total	1	9	53	137	163	117	14	6	
Percentages	0·2	1·8	10·6	27·4	32·6	23·4	2·8	1·2	

Chart 3.—Curve representing the Distribution, by Percentages, in respect to Length, of 500 Individuals of *T. pecorum*, Wild-game Strain, taken on nine consecutive days from Rat 510.



Breadth.—*T. pecorum*, Wild-game strain, measured across the broadest part of the body, not including the undulating membrane, averages 1·97 micron (maximum 2·75, minimum 1·25).

III. *The Wild* Glossina morsitans *Strain.*

The tsetse flies were brought from the neighbouring "fly-country" and fed on goats, monkeys, and dogs as described in a former paper.*

Length.—The following table gives the length of this trypanosome as found in the goat, monkey, dog, guinea-pig, and rat, 500 trypanosomes in all:—

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* 'Roy. Soc. Proc.,' 1913, B, vol. 86, p. 408.

Table VIII.—Measurements of the Length of *T. pecorum*—The Wild *Glossina morsitans* Strain.

Date.	No. of expt.	Animal.	Method of fixing.	Method of staining.	In microns.		
					Average length.	Maximum length.	Minimum length.
1912.							
Feb. 15...	89	Goat	Osmic acid	Giemsa	12·5	14·0	10·0
„ 19...	89	„	„	„	13·9	17·0	11·0
Mar. 4...	89	„	„	„	14·2	16·0	12·0
April 25...	363	„	„	„	14·4	17·0	11·0
June 13...	422	„	„	„	13·3	16·0	10·0
„ 17...	422	„	„	„	13·6	16·0	11·0
„ 20...	564	„	„	„	13·0	15·0	10·0
„ 24...	565	„	„	„	13·3	15·0	11·0
July 1...	565	„	„	„	12·9	15·0	9·0
„ 8...	634	„	„	„	14·5	17·0	12·0
June 10...	450	Monkey	„	„	13·6	15·0	12·0
July 8...	623	„	„	„	13·7	16·0	11·0
Mar. 9...	258	Dog	„	„	14·5	17·0	12·0
„ 18...	256	„	„	„	13·5	16·0	11·0
„ 18...	258	„	„	„	13·7	15·0	12·0
„ 18...	322	„	„	„	13·4	15·0	11·0
„ 21...	256	„	„	„	14·6	17·0	11·0
„ 21...	258	„	„	„	14·1	17·0	12·0
„ 21...	322	„	„	„	15·1	17·0	12·0
April 22...	400	„	„	„	14·7	17·0	13·0
May 16...	452	Guinea-pig	„	„	14·6	18·0	12·0
„ 9...	454	Rat	„	„	13·9	17·0	12·0
„ 9...	455	„	„	„	14·0	16·0	12·0
„ 16...	454	„	„	„	13·7	16·0	12·0
„ 16...	455	„	„	„	14·3	16·0	10·0
					13·9	18·0	9·0

The average length of the trypanosome of the Wild *Glossina morsitans* strain, in different species of animals, is as follows:—

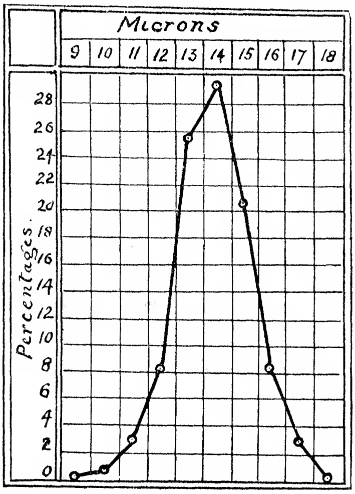
Table IX.

Species of animal.	Number of trypanosomes measured.	In microns.		
		Average length.	Maximum length.	Minimum length.
Goat	200	13·5	17·0	9·0
Monkey	40	13·6	16·0	11·0
Dog	160	14·2	17·0	11·0
Guinea-pig	20	14·6	18·0	12·0
Rat	80	14·0	17·0	10·0

Table X.—Distribution in respect to Length of the Wild *Glossina morsitans* Strain.

Animal.	In microns.										Average length.
	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	
Goat	—	1	3	5	6	5	—	—	—	—	12·5
"	—	—	1	4	3	5	3	3	1	—	13·9
"	—	—	—	2	1	9	6	2	—	—	14·2
"	—	—	2	—	3	4	7	2	2	—	14·4
"	—	1	3	1	3	9	2	1	—	—	13·3
"	—	—	1	—	9	7	2	1	—	—	13·6
"	—	1	—	4	8	6	1	—	—	—	13·0
"	—	—	1	1	11	4	3	—	—	—	13·3
"	1	—	1	3	8	6	1	—	—	—	12·9
"	—	—	—	1	3	5	7	3	1	—	14·5
Monkey	—	—	—	2	6	10	2	—	—	—	13·6
"	—	—	1	1	8	4	4	2	—	—	13·7
Dog	—	—	—	1	3	6	6	3	1	—	14·5
"	—	—	1	2	8	5	2	2	—	—	13·5
"	—	—	—	3	4	9	4	—	—	—	13·7
, ...	—	—	1	3	8	4	4	—	—	—	13·4
"	—	—	1	2	2	4	3	5	3	—	14·6
"	—	—	—	2	5	5	5	2	1	—	14·1
"	—	—	—	1	—	3	10	4	2	—	15·1
"	—	—	—	—	4	5	6	3	2	—	14·7
Guinea-pig	—	—	—	1	4	4	6	3	1	1	14·6
Rat	—	—	—	1	7	7	3	1	1	—	13·9
"	—	—	—	1	5	7	6	1	—	—	14·0
"	—	—	—	1	9	5	4	1	—	—	13·7
"	—	1	—	—	1	9	6	3	—	—	14·3
Total	1	4	16	42	129	147	103	42	15	1	
Percentages ...	0·2	0·8	3·2	8·4	25·8	29·4	20·6	8·4	3·0	0·2	

Chart 4.—Curve representing the Distribution, by Percentages, in respect to Length, of 500 Individuals of *T. pecorum*—The Wild *Glossina morsitans* Strain.



This curve is made up of measurements from 200 specimens of trypanosomes taken from the goat, 40 from the monkey, 160 from the dog, 20 from the guinea-pig, and 80 from the rat.

Breadth.—Measured across the broadest part of the body, not including the undulating membrane, *T. pecorum*, Wild *Glossina morsitans* strain, averages 1·94 micron (maximum 2·75, minimum 1·25).

COMPARISON OF THE MVERA CATTLE STRAIN, WILD-GAME STRAIN, AND WILD GLOSSINA MORSITANS STRAIN OF T. PECORUM.

The following table gives the average length of this trypanosome in the three strains under consideration, as found in the donkey, ox, goat, monkey, dog, guinea-pig, and rat:—

Table XI.—Measurements of the Length of the Trypanosomes of the Three Strains.

Date.	Strain.	No. of trypanosomes measured.	Animal.	In microns.		
				Average length.	Maximum length.	Minimum length.
1912	Mvera cattle	500	Various ...	14·0	18·0	9·0
1912	Wild game	500	„ ...	14·3	18·0	11·0
1912	Wild *G. morsitans* ...	500	„ ...	13·9	18·0	9·0

COMPARISON OF THE CURVES FROM THE THREE STRAINS.

CHART 5.—Curves representing the Distribution, by Percentages, in respect to Length, of *T. pecorum.* 500 specimens from each of the Mvera Cattle Strain, the Wild-game Strain, and the Wild *Glossina morsitans* Strain.

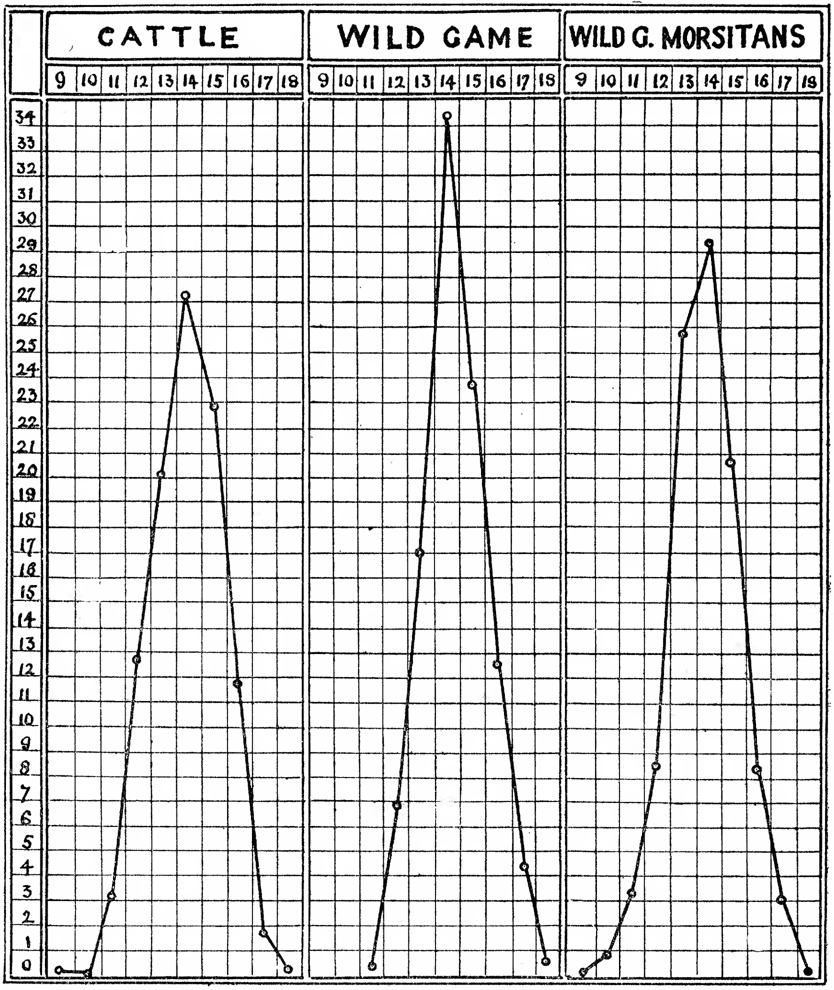


Table XII.—Distribution in respect to Length of 2000 Individuals of the Three Strains of *T. pecorum.* The trypanosomes have been taken at random from various animals.

	In microns.									
	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
Totals	2	6	42	193	452	618	453	178	51	5
Percentages	0·1	0·3	2·1	9·6	22·6	30·9	22·7	8·9	2·5	0·3

Chart 6.—Curve representing the Distribution, by Percentages, in respect to Length, of 2000 Individuals of the Three Strains of *T. pecorum*, Nyasaland, described in this paper.

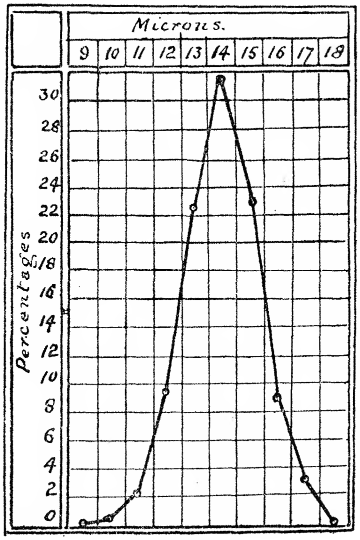


Table XIII.—Breadth of the Three Strains of *T. pecorum*. This does not include the undulating membrane.

Strain.	Average breadth.	Maximum breadth.	Minimum breadth.
Mvera cattle	1·97	3·0	1·25
Wild game..................	1·97	2·75	1·25
Wild *G. morsitans*	1·94	2·75	1·25
Average	1·96	2·83	1·25

ANIMALS SUSCEPTIBLE TO TRYPANOSOMA PECORUM.

I. *The Mvera Cattle Strain.*

Table XIV.

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
Donkeys.					
1912.					
Jan. 26...	291	Natural infection	?	—	Still alive after 377 days.
„ 26...	292	„	?	87 ?	Died of *T. pecorum*, April 22.
June 18...	705	„	?	—	Still alive after 233 days.
„ 18...	706	„	?	—	„ 233 „
„ 18...	709	„	?	—	„ 233 „
Cattle.					
Jan. 16...	15 *a*	Natural infection	?	—	Still alive after 387 days.
„ 16...	15 *b*	„	?	—	„ 387 „
„ 16...	15 *c*	„	?	—	„ 387 „
„ 16...	15 *d*	„	?	?	Died at Mvera of *T. pecorum*.
„ 16...	15 *e*	„	?	?	„ „
„ 16...	15 *f*	„	?	?	„ „
„ 16...	15 *g*	„	?	?	„ „
„ 16...	15 *h*	„	?	?	„ „
„ 16...	100	„	?	78 ?	Died of *T. pecorum*, April 28.
„ 16...	101	„	?	30 ?	„ „ Feb. 15.
„ 16...	102	„	?	—	Still alive after 387 days.
„ 16...	103	„	?	201 ?	Died of *T. pecorum*, Aug. 28.
„ 16...	104	„	?	—	Still alive after 387 days.
„ 16...	105	„	?	—	„ 387 „
„ 16...	110	„	?	?	Died at Mvera of *T. pecorum*.
„ 16...	174	„	?	?	„ „
Feb. 16...	226	From Dog 16	11	—	Still alive after 356 days.
„ 16...	227	„ 16	7	—	„ 356 „
„ 16...	228	„ 16	11	—	„ 356 „
		Average......	10	103	
Goats.					
Feb. 14...	203	From Cow 103	12	29	Died of *T. pecorum*.
„ 14...	205	„ 103	10	40	„ „
„ 14...	206	„ 103	15	35	„ „
„ 14...	208	„ 103	12	36	„ „
„ 16...	178	From Dog 16	12	38	„ „
„ 16...	199	„ 16	11	209	„ „
„ 16...	204	„ 16	10	—	Still alive after 356 days.
		Average......	12	64	
Dogs.					
Jan. 17...	16	From Cow 102	26	30	Died of *T. pecorum*.
„ 17...	17	„ 103	13	56	„ „
„ 17...	18	„ 101	—	—	Never showed trypanosomes.
„ 17...	19	„ 100	13	56	Died of *T. pecorum*.
Feb. 14...	217	„ 103	16	28	„ „
„ 16...	212	From Dog 16	6	26	„ „
„ 16...	214	„ 16	10	26	„ „
„ 16...	218	„ 16	17	22	„ „
„ 16...	225	„ 16	10	26	„ „
		Average......	14	34	

* Duration includes the days of incubation; it dates from day of infection.

Table XIV—*continued.*

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
		Guinea-pigs.			
1912. Feb. 14...	221	From Cow 103	—	—	Never showed trypanosomes.
„ 14...	222	„ 103	—	—	„ „
„ 16...	229	From Dog 16	—	—	„ „
„ 16...	230	„ 16	—	—	„ „
		Rats.			
Feb. 14...	224	From Cow 103	—	—	Never showed trypanosomes.
„ 16...	231	From Dog 16	—	—	„ „
„ 16...	232	„ 16	—	—	„ „
May 4...	508	From Cow 103	—	—	„ „
„ 4...	509	„ 103	—	—	„ „

* Duration includes the days of incubation; it dates from day of infection.

Disease set up in Various Animals by Trypanosoma pecorum, *Nyasaland—The Mvera Cattle Strain.*

Donkeys.—When the Commission arrived at Kasu in January, 1912, the neighbouring Mvera Mission Station owned a herd of 16 donkeys. On examining them five were found to be infected with *T. pecorum.* One died after ·87 days; the other four are at present free from trypanosomes and apparently in good health. It is true that three of the apparently recovered animals were given arsenic for some months, but the fourth, which got none, did equally well. It may also be noted that two of the four have recently given birth to healthy foals. Susceptible animals inoculated with the blood of the four donkeys remained healthy. From this it would appear that this strain of *T. pecorum* is not very fatal to donkeys.

Cattle.—A year ago the Mvera herd consisted of 50 head of cattle, and of these 16 were found to be infected with *T. pecorum.* At the present date 10 of these have died of this disease and six remain alive. The six have shown trypanosomes in their blood for some months, and their blood inoculated into healthy dogs has proved non-infective. In spite of this, however, these cattle remain in poor condition: thin, with rough, staring coats, and every appearance of suffering from a chronic disease, and it seems highly probable that more of them, if not all, will succumb to the effects of the trypanosome. Three oxen (Experiments 226, 227, and 228), which were inoculated from a dog whose blood contained *T. pecorum,* at the present date appear quite healthy and have apparently recovered.

Goats.—The Mvera Cattle strain is fatal to goats, killing them, as a rule, in 30 to 40 days. One goat lived 209 days, and another is still alive after a year and appears to have recovered.

Monkeys.—No experiments were made on monkeys with the Mvera Cattle strain.

Dogs.—It is curious that this strain, which is harmless to guinea-pigs and white rats, is the most virulent of the three to dogs, killing them, without exception, in about 30 days.

Guinea-pigs and White Rats.—The Mvera Cattle strain has no effect on guinea-pigs or white rats. It is important to note how different strains of *T. pecorum* vary in their behaviour to the smaller laboratory animals.

II. *The Wild-game Strain.*

Table XV.

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
			Goats.		
1912.					
Jan. 22...	45	From Eland 44	11	70	Died of *T. pecorum.*
Feb. 7...	141	From Goat 45	8	54	,, ,,
Mar. 16...	336	,, 45	9	48	,, ,,
,, 16...	337	,, 45	9	20	,, ,,
,, 16...	338	,, 45	9	41	,, ,,
July 20...	899	From Reedbuck 912 ...	12	—	Still alive after 201 days.
,, 23...	898	From Hyæna 955	13	89	Died of *T. pecorum.*
,, 30...	978	From Eland 1013	13	93	,, ,,
Aug. 11...	1037	From Waterbuck 1061	8	23	Mixed infection.
,, 18...	1035	From Bushbuck 1078...	18	—	Still alive after 172 days.
,, 18...	1037*a*	,, 1084...	22	23	Died of *T. pecorum.*
,, 19...	1106	From Oribi 1096.........	21	74	,, ,,
,, 24...	1121	From Eland 1202	16	82	,, ,,
Sept. 4...	1031	,, 1044	15	43	,, ,,
,, 7...	1135	From Bushbuck 1261...	19	85	,, ,,
,, 11...	1307	From Buffalo 1304......	26	35	,, ,,
,, 17...	1383	From Koodoo 1380......	6	68	,, ,,
Oct. 6...	1474	From Eland 1471	22	—	Still alive after 123 days.
		Average......	15	56	
			Monkeys.		
April 9...	403	From Dog 355............	9	236	Died of *T. pecorum.*
July 20...	913	From Reedbuck 912 ...	—	—	Never showed trypanosomes.
,, 23...	959	From Hyæna 955	—	—	,, ,,
,, 30...	1014	From Eland 1013	27	101	Died of *T. pecorum.*
Aug. 11...	1062	From Waterbuck 1061	—	—	Never showed trypanosomes.
,, 18...	1079	From Bushbuck 1078...	—	—	,, ,,
,, 18...	1085	,, 1084...	11	88	Died of *T. pecorum.*
,, 19...	1087	From Oribi 1096.........	—	—	Never showed trypanosomes.
Sept. 7...	1262	From Bushbuck 1261...	—	—	,, ,,
,, 11...	1305	From Buffalo 1304......	—	—	,, ,,
,, 17...	1381	From Koodoo 1380......	—	—	,, ,,
,, 25...	1478	From Hartebeeste 1453	—	—	,, ,,
		Average	15	142	

* Duration includes the days of incubation; it dates from day of infection.

Table XV—*continued.*

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
			Dogs.		
1912.					
Jan. 22...	46	From Eland 44	—	—	Never showed trypanosomes.
Feb. 7...	134	From Goat 45	8	35	Died of *T. pecorum.*
,, 7...	138	,, 45	—	—	Never showed trypanosomes.
Mar. 20...	355	,, 45	8	222	Died of *T. pecorum.*
,, 20...	356	,, 45	12	30	,, ,,
,, 20...	357	,, 45	—	—	Never showed trypanosomes.
May 4...	514	From Dog 355...........	12	20	Died of *T. pecorum.*
,, 4...	515	,, 355...........	9	20	,, ,,
July 20...	914	From Reedbuck 912 ...	—	—	Never showed trypanosomes.
,, 23...	963	From Hyæna 955	—	—	,, ,,
,, 30...	1015	From Eland 1013	15	83	Died of *T. pecorum.*
Aug. 11...	1063	From Waterbuck 1061	—	—	Never showed trypanosomes.
,, 18...	1080	From Bushbuck 1078...	—	—	,, ,,
,, 18...	1086	,, 1084...	8	156	Died of *T. pecorum.*
,, 19...	1098	From Oribi 1096.........	—	—	Never showed trypanosomes.
,, 27...	1204	From Eland 1202	27	—	Alive after 163 days.
Sept. 7...	1263	From Bushbuck 1261...	—	—	Never showed trypanosomes.
,, 11...	1306	From Buffalo 1304......	—	—	,, ,,
,, 17...	1382	From Koodoo 1380......	—	—	,, ,,
,, 25...	1455	From Hartebeeste 1453	8	24	Died of *T. pecorum.*
		Average	12	74	
			Guinea-pig.		
Mar. 20...	358	From Goat 45	—	—	Never showed trypanosomes.
			Rats.		
Mar. 20...	360	From Goat 45	—	—	Never showed trypanosomes.
,, 21...	361	,, 45	—	—	,, ,,
May 4...	510	From Dog 355...........	9	29	Died of *T. pecorum.*
,, 4...	511	,, 355...........	9	14	,, ,,
Oct. 28...	1518	,, 355...........	—	—	Never showed trypanosomes.
,, 28...	1519	,, 355...........	—	—	,, ,,
Nov. 15...	1518	From Monkey 403	10	30	Died of *T. pecorum.*
,, 15...	1519	,, 403	17	30	,, ,,
,, 16...	1608	From Goat 1135	16	45	,, ,,
		Average	12	30	

* Duration includes the days of incubation; it dates from day of infection.

Disease set up in Various Animals by T. pecorum, *Nyasaland—The Wild-game Strain.*

Cattle.—No cattle were available for experiment.

Goats.—As might be expected, *T. pecorum* from the blood of antelope behaves in the same way to goats as that from cattle. It has the same virulence, gives rise to the same symptoms and *post-mortem* appearances.

Monkeys.—The monkey is an animal not very susceptible to *T. pecorum.*

Blood taken from a wild animal and injected at the same time and under exactly the same conditions into a healthy goat, monkey, and dog, will often infect the first and last and fail to infect the monkey. In 10 experiments in which all the goats became infected, 8 of the 10 monkeys remained healthy. The disease is also much more chronic in the monkey than in the goat, the average duration of the disease in the former being 142 days, whereas in the latter it is only 56 days.

Dogs.—In comparison with the goat, the dog is also somewhat refractory to the Wild-game strain. In nine experiments all the goats became infected, while their companion dogs, injected with the same blood, remained healthy.

Guinea-pigs.—The one guinea-pig inoculated remained unaffected.

White Rats.—This strain is irregular in its action towards white rats. In nine experiments four remained healthy, although the five which did become infected died, on an average, in 30 days, which is moderately rapid for *T. pecorum.*

III. *The Wild* Glossina morsitans *Strain.*

Table XVI.

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
			Cattle.		
1912. Feb. 3...	108	Fly country..............	?	140	Mixed infection.
			Goats.		
Jan. 25...	89	Wild flies	15	60	Died of *T. pecorum.*
Feb. 3...	125	"	7	36	Mixed infection.
" 8...	175	"	20	88	" "
" 13...	200	"	—	—	Never showed *T. pecorum.*
" 19...	247	"	21	30	Mixed infection.
" 22...	281	"	10	59	" "
Mar. 6...	273	"	6	47	" "
" 9...	270	"	—	—	Never showed *T. pecorum.*
" 18...	343	"	11	34	Died of *T. pecorum.*
" 23...	363	"	12	43	Mixed infection.
" 28...	369	From Goat 109	21	—	Still alive after 315 days.
April 1...	397	Wild flies	10	60	Mixed infection.
" 3...	408	"	11	40	Died of *T. pecorum.*
" 10...	410	"	—	—	Never showed *T. pecorum.*
" 15...	414	"	10	36	Mixed infection.
" 18...	428	"	—	—	Never showed *T. pecorum.*
" 19...	422	"	7	69	Mixed infection.
" 23...	420	"	—	—	Never showed *T. pecorum.*
" 24...	415	"	16	49	Mixed infection.
" 29...	429	"	12	43	" "
" 29...	430	"	10	45	" "

* Duration includes the days of incubation; it dates from day of infection.

Table XVI—*continued.*

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
		Goats—*continued.*			
1912.					
May 4...	434	Wild flies	9	—	Still alive after 277 days.
„ 9...	266	„	8	71	Mixed infection.
„ 9...	269	„	14	22	„ „
„ 15...	416	„	5	19	„ „
„ 17...	553	„	—	—	Never showed *T. pecorum.*
„ 24...	565	„	7	56	Mixed infection.
„ 28...	564	„	5	29	Died of *T. pecorum.*
„ 28...	568	„	9	24	Mixed infection.
„ 31...	570	„	4	64	„ „
June 1...	569	„	5	36	„ „
„ 1...	571	„	11	23	„ „
„ 2...	620	„	—	—	Never showed *T. pecorum.*
„ 5...	622	„	15 ?	34	Mixed infection.
„ 8...	627	„	12	24	„ „
„ 10...	634	„	9	—	Still alive after 241 days.
„ 10...	635	„	13	63	Died of *T. pecorum.*
„ 14...	640	„	18	60	„ „
„ 17...	645	„	16	32	„ „
„ 25...	716	„	10	64	Mixed infection.
July 5...	711	„	20	106	Died of *T. pecorum.*
„ 9...	795	„	10	40	„ „
Oct. 14...	1689	From Goat 1635.........	9	38	Mixed infection.
„ 28...	1516	Wild flies	8	31	„ „
„ 31...	1538	„	8	24	„ „
Nov. 13...	1588	„	9	—	Still alive after 85 days.
„ 18...	1613	„	—	—	Never showed *T. pecorum.*
„ 27...	1638	„	10	65	Mixed infection.
Dec. 5...	1667	„	11	—	Still alive after 63 days.
„ 6...	1676	„	4	41	Mixed infection.
„ 11...	1685	„	6	38	„ „
„ 14...	1693	From Goat 1634.........	9	—	Still alive after 54 days.
„ 19...	1703	Wild flies	7	—	„ „ 49 „
		Average......	11	46	
		Pigs.			
Nov. 18...	1611	Wild flies	—	—	Never showed *T. pecorum.*
„ 25...	1636	„	13	—	Still alive after 73 days.
Dec. 3...	1665	„	6	17	Mixed infection.
„ 6...	1674	„	3	10	„ „
„ 11...	1683	„	—	—	Never showed *T. pecorum.*
„ 16...	1701	„	6	12	Mixed infection.
1913.					
Jan. 1...	1725	„	6	21	Died of *T. pecorum.*
„ 16...	1771	From Dog 1702	14	—	Still alive after 21 days.
„ 21...	1781	Wild flies	6	—	„ „ 16 „
		Average......	8	15	
		Monkeys.			
1912.					
Jan. 24...	55	Wild flies	—	—	Never showed *T. pecorum.*
Feb. 8...	58	„	—	—	„ „
„ 13...	219	„	7	9	Mixed infection.
„ 20...	49	„	—	—	Never showed *T. pecorum.*

* Duration includes the days of incubation; it dates from day of infection.

Table XVI—*continued.*

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
		Monkeys—*continued.*			
1912.					
April 10...	404	Wild flies	—	—	Never showed *T. pecorum.*
" 15...	405	"	—	—	" "
" 18...	447	"	—	—	" "
" 18...	448	"	—	—	" "
" 19...	450	From Dog 328	24	202	Died of *T. pecorum.*
" 19...	451	" 328	17	165	" "
" 23...	465	Wild flies	—	—	Never showed *T. pecorum.*
" 23...	467	"	24	188	Died of *T. pecorum.*
" 26...	488	"	—	—	Never showed *T. pecorum.*
" 27...	495	"	—	—	" "
May 3...	504	"	7	11	Mixed infection.
" 3...	505	"	—	—	Never showed *T. pecorum.*
" 8...	523	"	—	—	" "
" 9...	521	"	—	—	" "
" 14...	545	"	—	—	" "
" 29...	596	"	34	150	Died of *T. pecorum.*
" 31...	601	"	—	—	Never showed *T. pecorum.*
June 6...	623	"	24	180	Died of *T. pecorum.*
" 7...	625	"	—	—	Never showed *T. pecorum.*
" 11...	629	"	—	—	" "
" 18...	702	"	—	—	" "
" 25...	739	"	—	—	" "
July 3...	788	"	—	—	" "
Sept. 25...	1452	"	21	34	Died of *T. pecorum.*
Oct. 29...	1536	"	—	—	Never showed *T. pecorum.*
Nov. 11...	1586	"	—	—	" "
		Average......	20	117	
		Dogs.			
Feb. 24...	258	From Monkey 219	12	43	Died of *T. pecorum.*
" 28...	256	From Goat 89............	15	24	" "
Mar. 9...	321	" 125............	12	34	" "
" 9...	322	" 125............	9	48	" "
" 9...	323	" 89............	12	26	" "
" 9...	324	" 89............	12	24	" "
" 9...	328	Wild flies	23	39	" "
" 17...	341	"	15	28	" "
" 20...	359	From Dog 258............	8	14	" "
" 22...	362	Wild flies	10	17	" "
April 3...	400	"	16	18	" "
" 12...	436	"	8	37	Mixed infection.
" 17...	446	"	33	60	Died of *T. pecorum.*
" 20...	463	"	21	57	" "
" 20...	464	"	13	57	" "
" 24...	478	"	18	56	" "
" 25...	466	"	15	50	" "
" 25...	468	"	11	21	" "
" 29...	489	"	15	49	" "
" 30...	496	"	12	46	" "
May 6...	506	"	17	41	" "
" 6...	507	"	19	42	" "
" 8...	525	"	—	—	Never showed *T. pecorum.*
" 10...	522	"	18	38	Died of *T. pecorum.*
" 17...	549	From Monkey 523	10	51	Mixed infection.

* Duration includes the days of incubation; it dates from day of infection.

Table XVI—*continued.*

Date.	No. of expt.	Source of virus.	Period of incubation, in days.	Duration of disease, in days.*	Remarks.
		Dogs—*continued.*			
1912.					
May 17...	551	Wild flies	8	25	Mixed infection.
,, 18...	548	,, ...	30	—	Still alive after 258 days.
,, 24...	578	,, ...	18	24	Died of *T. pecorum.*
,, 28...	574	,, ...	15	33	,, ,,
,, 29...	595	,, ...	3	22	Mixed infection.
,, 29...	599	,, ...	22	152	Died of *T. pecorum.*
,, 31...	597	,, ...	8	30	,, ,,
,, 31...	602	,, ...	5	—	Still alive after 175 days.
June 2...	619	,, ...	10	28	Died of *T. pecorum.*
,, 7...	624	,, ...	17	29	,, ,,
,, 8...	626	,, ...	8	54	Mixed infection.
,, 9...	630	,, ...	13	21	Died of *T. pecorum.*
,, 13...	666	,, ...	12	—	Still alive after 231 days.
,, 19...	701	,, ...	11	19	Died of *T. pecorum.*
,, 25...	729	,, ...	—	—	Never showed *T. pecorum.*
July 4...	734	,, ...	14	—	Still alive after 210 days.
Oct. 29...	1537	,, ...	—	—	Never showed *T. pecorum.*
Nov. 12...	1587	,, ...	20	58	Died of *T. pecorum.*
,, 19...	1612	,, ...	17	—	Still alive after 78 days.
,, 19...	1615	From Goat 1610.........	9	17	Died of *T. pecorum.*
,, 25...	1637	Wild flies	—	—	Never showed *T. pecorum.*
Dec. 4...	1666	,, ...	12	32	Died of *T. pecorum.*
,, 6...	1675	,, ...	—	—	Never showed *T. pecorum.*
,, 11...	1684	,, ...	—	—	,, ,,
,, 14...	1691	From Goat 1634.........	9	21	Mixed infection.
,, 14...	1695	,, 1635.........	5	16	,, ,,
,, 18...	1702	Wild flies	16	33	Died of *T. pecorum.*
		Average......	14	37	
		Guinea-pigs.			
April 19...	452	From Dog 328	13	42	Died of *T. pecorum.*
June 14...	672	,, 602	—	—	Never showed *T. pecorum.*
,, 14...	673	,, 602	24	38	Died of *T. pecorum.*
,, 14...	674	,, 547	—	—	Never showed *T. pecorum.*
,, 14...	675	,, 547	24	44	Died of *T. pecorum.*
,, 14...	676	,, 549	—	—	Never showed *T. pecorum.*
,, 14...	677	,, 549	—	—	,, ,,
,, 14...	680	,, 551	13	39	Mixed infection.
,, 14...	681	,, 551	20	42	,, ,,
,, 14...	682	,, 595	—	—	Never showed *T. pecorum.*
,, 14...	683	,, 595	—	—	,, ,,
		Average......	19	41	
		Rats.			
April 19...	454	From Dog 328	6	28	Died of *T. pecorum.*
,, 19...	455	,, 328	11	30	,, ,,
June 11...	657	,, 551	13	31	Mixed infection.
,, 11...	660	,, 602	5	70	,, ,,
,, 12...	655	,, 549	—	—	Never showed *T. pecorum.*
,, 14...	658	,, 595	—	—	,, ,,
Nov. 19...	1616	,, 1610	—	—	,, ,,
Dec. 14...	1692	,, 1634	9	27	Mixed infection.
,, 14...	1696	,, 1635	—	—	Never showed *T. pecorum.*
		Average......	9	37	

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* Duration includes the days of incubation; it dates from day of infection.

Disease set up in Various Animals by T. pecorum, *Nyasaland—The Wild* G. morsitans *Strain.*

Cattle.—Only one ox was experimented with. It was sent into the "fly-country," and as a result incurred a double infection of *T. pecorum* and *T. capræ,* and died in 140 days.

Goats.—The wild flies brought up from the "low-country" were fed, as a rule, on a goat, monkey, and dog. As the flies were often infected with several species of pathogenic trypanosomes, the result was many cases of mixed infection. In 50 experiments with goats, 10, or one-fifth only, were infections with *T. pecorum* alone. As *T. pecorum* is the most rapidly fatal trypanosome to goats among the various kinds of trypanosomes found in this locality, it may be assumed that the 28 goats which died of mixed infection owed this mainly to the *T. pecorum* infection.

Pig.—In eight feeding experiments with wild *G. morsitans,* only two showed a pure infection with *T. pecorum.* One died in 21 days and the other is still alive after 16 days. Another pig was inoculated from Dog 1702 and is still alive after 21 days. This species of domestic animal may, therefore, be said to be susceptible to this disease.

Monkey.—To this strain as to the Wild-game strain the monkey shows its refractoriness. These animals had the same chance of taking the disease as the goats and the dogs, but in 28 experiments the monkeys only became infected six times (21·4 per cent.), whereas in 50 goats there were 42 infections (84 per cent.), and in 41 dogs 35 (85·4 per cent.). The duration of the disease in the monkey is also long, the average in four cases being 138 days.

Dogs.—The Wild *G. morsitans* strain is fatal to dogs, killing them, on an average, in 41 days. In 35 cases of this disease among dogs, only five have survived to the present date. One of these may be said to have recovered, as the trypanosomes disappeared from the blood and the blood ceased to be infective. The other four still show trypanosomes in the blood after 258, 231, 210, and 78 days respectively. The dog may, therefore, be said to be as susceptible to the Wild *G. morsitans* strain of *T. pecorum* as the goat, few escaping the disease when bitten by an infective fly.

Guinea-pigs and White Rats.—The susceptibility of these animals to the Wild *G. morsitans* strain would be considered by some to go to prove that exaltation of virulence obtains after passage through the fly. This, however, is doubtful. Passage through the fly would more probably restore the trypanosome to its normal form—sometimes increasing, sometimes decreasing, its virulence for a particular animal.

COMPARISON OF THE THREE STRAINS IN REGARD TO THEIR VIRULENCE TOWARDS VARIOUS ANIMALS.

Table XVII.—The Average Duration of the Disease in Various Animals, in days. The letter R means that the animal is refractory, that is, not susceptible to the disease.

Strain.	Donkey.	Ox.	Goat.	Pig.	Monkey.	Dog.	Guinea-pig.	White rat.
Mvera Cattle	87 ?	103 ?	64			34	R	R
Wild Game			56		142	74	R	30
Wild *G. morsitans*		140	46	21	117	37	41	37

On the whole it may be concluded that the Wild *G. morsitans* strain is the most virulent.

Table XVIII.—The Percentages of Recoveries in Various Animals from the Three Strains. The letter R stands for refractory.

Strain.	Donkey.	Ox.	Goat.	Pig.	Monkey.	Dog.	Guinea-pig.	White rat.
Mvera Cattle	80	37	14			0	R	R
Wild Game			17		0	0	R	0
Wild *G. morsitans*		0	6		0	2	0	0

It must be confessed that the margin of error in a table such as this must be enormous; the fallacies are many. It is difficult or impossible to say when or if an animal has recovered from a trypanosome disease. The numbers employed are often small. For example, there is 0 per cent. indicated in regard to Guinea-pig, Wild game strain. This animal is returned as refractory, but there was only one experiment. It is evident that it would be more satisfactory if, say, a minimum of 10 animals of each species was used in studying each different strain. But in the wilds of Nyasaland this is a counsel of perfection impossible to attain. At the present time the Commission finds the greatest difficulty in obtaining small numbers of such local animals as goats, monkeys, and dogs, while as to the smaller laboratory animals, they must come from England. This entails a heavy mortality, as may be judged from the fact that of the last consignment of 25 guinea-pigs and 50 rats only 9 of the former and 12 of the latter arrived at Kasu alive.

THE AVERAGE DURATION OF LIFE, IN DAYS, OF VARIOUS ANIMALS INFECTED BY T. PECORUM, NYASALAND.

The following table combines the results obtained from a study of the susceptibility of various animals to each of the three strains, so as to arrive at a numerical expression of the virulence of the *T. pecorum* of Nyasaland. It must be carefully noted that only fatal cases are taken into account. In human medicine duration of disease means the number of days between the beginning of the illness and recovery. Here it means the number of days between infection and death. The table also shows against which animal the energies of *T. pecorum* are chiefly directed. It is certain that it is only by the detailed study of many strains of each of the African species of trypanosomes that a satisfactory classification of this important group of hæmatozoa will be arrived at. This work must be done on the spot, where the natural conditions for the normal life of the parasite are present, and where frequent opportunity of passing through the invertebrate host—the tsetse fly—exists. It is absurd to expect to arrive at any classification at all approaching a true one by the study of strains of trypanosomes kept for many years and undergoing many vicissitudes in our European laboratories.

Table XIX.—The Average Duration of Life, in days, of Various Animals infected by *T. pecorum*.

	Donkey.	Cattle.	Goat.	Pig.	Monkey.	Dog.	Guinea-pig.	White rat.
Average duration, in days	87 ?	121 ?	55	21	129	48	41	33
Number of animals employed	1	4	59	1	11	57	5	10

Table XX.—The Percentages of Recoveries in Various Animals from *T. pecorum* Infection.

	Donkey.	Cattle.	Goat.	Pig.	Monkey.	Dog.	Guinea-pig.	White rat.
Percentages	80	35	12	0	0	1	0	0
Number of animals employed	5	17	70	1	11	63	5	10

The Carrier of T. pecorum, Nyasaland.

In Nyasaland the carrier is *G. morsitans,* of which 4·6 per 1000 were found infected by this species. This is the minimum, but the real proportion of infected flies is probably three or four times as great. An account of the development of *T. pecorum* in this tsetse fly will be dealt with in a future paper. There is also some evidence derived from the outbreak among the Mvera cattle that, given infected animals in a herd, it is possible that *Tabanidæ,* *Hæmatopota,* or other biting flies may act as mechanical carriers. The evidence that *Stomoxys* plays a similar *rôle* is unsatisfactory.

CONCLUSIONS.

1. The Mvera Cattle strain, the Wild-game strain and the Wild *G. morsitans* strain belong to the same species of trypanosome, *T. pecorum.*
2. *T. pecorum,* Nyasaland, is identical with the species found and described in Uganda.
3. It is an important disease of domestic animals in Nyasaland, being destructive to donkeys, oxen, goats, pigs, and dogs.
4. Its carrier in this district is *G. morsitans,* about 2 per cent. probably of the local wild flies being naturally infected with *T. pecorum.*
5. Its reservoir is the wild game inhabiting "fly-country," 14·4 per cent. of which were found to be infected with this trypanosome. It is hardly to be doubted that 100 per cent. are, or have been, infected.
6. It is recommended that if infected animals are found in a herd they should be destroyed or segregated, as there is a danger of biting flies other than the tsetse spreading the disease in the herd by mechanical transmission.

Morphology of Various Strains of the Trypanosome causing Disease in Man in Nyasaland.—The Mzimba Strain.

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(Scientific Commission of the Royal Society, Nyasaland, 1913.)

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[PLATES 1–3.]

INTRODUCTION.

Up to the present time it has usually been considered that almost all the cases of Human trypanosome disease in man in Nyasaland have been confined to a small area. This, the so-called Sleeping-Sickness District, has been described in a former paper,* but it may be repeated here that it is the part of the "fly-country" lying along the western shore of Lake Nyasa,

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* 'Roy. Soc. Proc.,' B, vol. 86, p. 274.